JOINT TASK FORCE REPORT ON OFFSHORE PIPELINES

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EXECUTIVE SUMMARY

On two separate occasions, fishing vessels operating in the shallow near-shore waters of the Gulf of Mexico have struck submerged pipelines. In each of the accidents, the product ignited resulting in an explosion and the deaths of several of the crew members. Investigations into the accidents found the pipelines to be exposed above the ocean bottom.

After the second accident, the National Transportation Safety Board (NTSB) issued a recommendation for the Department of Transportation to organize an effort to determine the danger of offshore pipelines to marine vessels. In response to this recommendation, a multi-agency, joint task force on offshore pipelines was formed to study the issue.

This report, which reviews and assesses the adequacy of offshore pipeline safety, represents the combined views of representatives from the Federal and State task force agencies directly involved in marine navigation or pipeline regulation in the Gulf.

The task force reviewed information, views, concerns, and recommendations provided by the government and the marine and pipeline industries. The assessment focused on the extent and adequacy of federal requirements, the technology for determining pipeline location and cover, the extent and availability of maps and charts depicting the locations of pipelines, and what could be done through governmental agency initiatives to enhance safety.

The task force concluded that it was clear from the accidents involving fishing vessels and submerged pipelines, that exposed pipelines, including abandoned pipelines, pose a potential risk to navigation safety, especially for mariners operating in the shallow near-shore waters. Underwater inspections of offshore pipelines have not been performed. To reduce the likelihood of further casualties, pipeline owners and operators should inspect these pipelines at regular intervals and exposed pipelines should be re-buried. Also of concern are hurricanes that can significantly accelerate the erosion of coastal lands and cause an offshore pipeline to become exposed on the ocean bottom.

However, all of the burden must not be placed on the pipeline owner/operators. Vessel operators, in an effort to protect themselves and their crews, must make changes in the manner in which vessels are operated, including a greater use of prudent seamanship.

Currently, there are two operational systems, the magnetic system and the physical probe available for the detection of pipeline location and burial depth in offshore waters. Additional development is underway on acoustic systems and the pulse induction technology. Internal systems such as the internal inspection "pigs" to determine offshore burial depth are in the initial stages of development and require further testing. Cost estimates for inspections vary, with probing being the most expensive and internal inspection potentially being the least expensive. Industry supported testing and development has increased and should improve the capability and performance of inspections, and reduce costs.

Offshore pipelines are not adequately mapped or charted. Where pipelines are mapped and charted, the information between Federal agencies, State agencies, and private industry differs. Nautical charts depicting submerged pipelines can enhance navigation safety, but construction of these charts requires data that is accurate and complete as the government accepts liability for the charts.

Greater coordination between Federal and State government agencies regarding information on offshore pipelines is essential to ensure adequate data bases and maps of offshore pipelines. Development of a data base on the location, condition, configuration, and status of offshore pipelines is essential to meeting agency requirements. Handling of the data base can logically be divided into a mapping portion and a descriptive portion with keys to link the two. Greater coordination between government agencies regarding offshore pipeline regulations and permits is essential to eliminate overlapping jurisdictions, and to assure coordinated and similar regulations for offshore pipelines. Once the pipelines are adequately charted, the use of charts by vessels would improve the mariner's awareness of the location of offshore pipelines when navigating or when using bottom dragging equipment in shallow waters.

The task force recommends that the Office of Pipeline Safety (OPS) propose regulations concerning the burial and surveillance of offshore pipelines to incorporate the requirements of the pending pipeline safety legislation and the findings of this report. In addition, the OPS should work with the Minerals Management Service (MMS) to better define their respective jurisdictions regarding pipelines on the OCS to preclude overlapping jurisdiction and overlapping regulations.

All agencies should improve and coordinate their efforts to accurately determine the location and ownership of all pipelines in both Federal and State waters in the Gulf of Mexico. A single geographic data base to meet the mapping needs should be developed and made accessible to all the agencies involved. The types of descriptive data, such as status, materials, contents, repair histories, etc., that must be tracked differs between the agencies and should be managed individually. Pipeline segments should be uniquely identified to correlate the mapping data with the descriptive data.

All agencies should work with the National Ocean Service (NOS) and other agencies involved in establishing a policy and/or regulation change to ensure that all new as-built pipeline information is submitted to NOS for determination of whether a particular pipeline should be depicted on nautical charts. Additionally, all agencies should work with NOS to bring the navigational charts up-to-date as far as the existing pipelines are concerned and to investigate the discrepancies discovered during the review of existing mapping information with emphasis on updating the coastal series charts.

Consideration should also be given to the question of geographic extent of these efforts. While the accidents occurred on offshore pipelines in the Gulf, other recent incidents (such as in Arthur Kill, New York Harbor) have involved submerged pipelines in internal waters and in other parts of the country. While offshore oil and gas pipelines are largely limited to the Gulf at present, there are numerous pipelines in internal waters and many offshore pipelines in other geographic locations that should be considered in the development of regulations.

The dialogue regarding the safety of offshore pipelines and marine vessels should be continued with periodic meetings of local agencies in the Gulf area.

JOINT TASK FORCE REPORT

ON OFFSHORE PIPELINES

BACKGROUND

On July 24, 1987, while maneuvering in the shallow coastal waters off the coast of Louisiana, the fishing vessel SEA CHIEF struck and ruptured an 8-inch diameter natural gas liquid pipeline operating at a pressure of 480 psi. The natural gas liquids were ignited, resulting in the deaths of two crewmen. The pipeline was originally installed in 1968 and buried onshore, parallel to the shoreline. Between 1968 and 1987, the shoreline underwent substantial erosion and subsidence. At the time of the accident, the pipeline was reportedly exposed on the natural bottom of the Gulf, in open water approximately one mile offshore. A diving survey conducted the day after the accident indicated that the pipeline, 50 feet from the accident site, had a 6-inch cover of soft mud.

Another accident occurred on October 3, 1989, when the fishing vessel NORTHUMBERLAND was maneuvering in 9-11 feet of water in the Gulf, about one-half mile offshore of Sabine Pass, Texas. The stern of the vessel struck and ruptured a 16-inch diameter natural gas pipeline operating at a pressure of 835 psi. Eleven crew members died as a result of the ignition of the released gas. The pipeline was installed in 1973, at a depth of 8-10 feet below the natural bottom of the Gulf. Following the accident, divers reported that, based upon the extent of marine growth on the pipeline, it had been exposed above the mud line for one or more years.

On February 14, 1990, at the request of the Director of the Office of Pipeline Safety (OPS) in the Research and Special Programs Administration of the Department of Transportation (DOT), a meeting between the Minerals Management Service (MMS), the National Ocean Service (NOS) of the National Oceanic and Atmospheric Administration (NOAA), the U.S. Coast Guard, and the U.S. Army Corps of Engineers (Corps) was held to gain an understanding of the risks posed in the Gulf by the coexistence of pipelines and vessel operations. The Director of OPS also sought to identify possible near-term and long term solutions which the Federal government should pursue. The results of the meeting established the need for further review and evaluation by a joint task force.

A joint task force was formed and was made up of representatives from five Federal agencies. Because of the substantial number of pipelines in their State waters, and because of similar concerns for offshore safety, representatives from two State agencies also participated. The participating organizations were:

Department of Transportation
Research and Special Programs Administration/Office of Pipeline Safety
U.S. Coast Guard

Department of Interior
Minerals Management Service

Department of Commerce
National Oceanic and Atmospheric Administration/National Ocean Service

Department of Defense
U.S. Army Corps of Engineers

State of Louisiana
Louisiana Office of Conservation

State of Texas
Railroad Commission of Texas

INTRODUCTION

The Gulf shoreline in Louisiana and Texas has been eroding for many years. Also, bottom conditions change because of current and wave action. The erosion of the coastal lands in the Gulf is the highest in the U.S. Between 1974 and 1982, the rate of erosion of the shoreline west of Sabine Pass, Texas, has averaged 15 feet per year. As a result of these conditions, gas and hazardous liquid pipelines existing in shallow near-shore and offshore waters have become exposed, even though the pipelines were originally buried on or offshore. Hurricanes can accelerate the erosion of coastal lands significantly and lead to the removal of sediment covering a pipeline.

Fishing vessels fish from shallow waters close to the beach to as far as 20 miles offshore. It is estimated that 80-90 percent of the fish are caught within 3 miles of the shore, and that approximately 40-50 percent of the fish are caught within one mile of shore.

Many companies do not specify a minimum depth of water into which the captain of the vessel may take the vessel. Vessel captains fish wherever they deem it necessary for the vessel to go in order to catch fish. In doing so, it is common for vessels that are able to maneuver in shallow waters to come into contact with the sea bottom during fishing operations. This practice can result in vessels striking exposed pipelines, with the potential for catastrophic accidents such as the SEA CHIEF and the NORTHUMBERLAND incidents. The recent accidents were caused when vessels struck exposed pipelines resulting in multiple fatalities.

Operators of offshore natural gas and hazardous liquid pipelines do not, as a matter of industry practice, inspect underwater pipelines to ensure they remained buried. The OPS regulations require surface surveillance which is performed primarily by aerial patrol. The OPS regulations also require pipelines to be maintained so they do not present a hazard to navigation.

Offshore pipelines in shallow waters which become exposed, pose a risk to the safety of commercial fisherman and other vessel operators whose vessels may come into contact with them. Mariners may be unaware of the location of submerged pipelines if they do not carry nautical charts or if the depiction of the pipelines on the charts is not complete. Vessels of less than 1,600 gross tons (which includes most commercial fishing vessels) are not required to carry nautical charts. The Coast Guard has published proposed rules (55 FR 14924; April 19, 1990) that would require fishing vessels operating beyond the Boundary Line or with more than 16 individuals on board to have up-to-date nautical charts. The Boundary Line generally follows the shoreline

and crosses the entrance to bays, inlets, and rivers. However, in the Gulf of Mexico, the Boundary Line follows the 12-mile line marking the Contiguous Zone (46 CFR 7.105).

Statistics from the OPS data base for the period July 1984 to July 1990 indicate there were 100 reportable offshore accidents with 20 fatalities and 16 injuries. Few of these accidents were caused by vessels. However, two of the three accidents involving fishing vessels resulted in 13 of the 20 fatalities and 3 of the 5 injuries. Accident data is listed in Appendices A and B.

The safety problems with submerged pipelines are not confined to the offshore areas of the Gulf. Although the accidents in which fishing vessels have struck offshore pipelines occurred in the Gulf, similar hazards can exist in other geographical locations. While the Gulf contains most of the pipelines and has the ocean bottoms most prone to erosion, submerged pipelines under a river, shipping channel, or other body of water are also susceptible to being unburied and damaged or ruptured by a vessel. For example, on January 2, 1990, a submerged 12-inch pipeline transporting heating oil was ruptured in the Arthur Kill Channel between Staten Island, New York and Linden, New Jersey.

On February 22, 1990, the NTSB issued recommendations to the DOT and the Department of the Interior (DOI) regarding the NORTHUMBERLAND accident. The NTSB stated in its investigative report of the NORTHUMBERLAND accident "...that the DOT, as the primary Federal agency responsible for pipeline safety, is best able to organize and coordinate an effort by Federal, State, and industry organizations to determine the danger of offshore pipelines to marine vessels...and that the DOI, as the primary agency for OCS development, should assist the DOT in this effort."

The NTSB recommended the following actions to DOT (recommendations to assist DOT in the first two recommendations were issued to DOI):

- Issue an advisory notice or use other means to caution commercial fishing, shrimping, and other marine vessel operators in the Gulf of Mexico that submerged offshore pipelines may be unprotected on the ocean floor and that marine vessels can damage such pipelines and endanger their crews when operating in water depths comparable to a vessel's draft or when operating bottom dragging equipment. (P-90-3)

- Identify, with the assistance of the Department of the Interior and other Gulf Coast States that may have jurisdiction, the type, number, location, and owner of all offshore pipelines in the Gulf of Mexico. (P-90-4)

- Determine, with the assistance of the Department of the Interior, effective methods of inspection, maintenance, and protection for offshore pipelines located in the Gulf of Mexico to depths of water comparable to the maximum drafts of marine vessels that may operate outside of established sea lanes. (P-90-5)

Congressional concern for offshore safety was first expressed in a February 26, 1990, hearing of the House Subcommittee on Coast Guard and Navigation of the Committee on Merchant Marine and Fisheries. A second hearing regarding safety in the marine environment was held by the Subcommittee on May 16, 1990. A third hearing was held on September 11, 1990, by the joint House Subcommittee on Energy and Power and the Subcommittee on Surface Transportation. This legislative interest culminated on October 27, 1990, in passage of H.R. 4888 amending the Natural Gas

Pipeline Act of 1968, the Hazardous Liquid Pipeline Act of 1979, and the Ports and Waterways Safety Act. These amendments were signed into law on November 16, 1990 (Public Law 101-599) and are included in the report as Appendix C.

The OPS issued an Alert Notice on April 9, 1990, in response to Recommendation P-90-3. (Appendix D). The notice was developed by the task force as a first effort in enhancing offshore safety. In addition, on May 18, 1990, the Coast Guard issued a safety notice which was published in the Local Notice to Mariners by the Coast Guard district offices in the Gulf of Mexico (Appendix E). As noted previously, assessment of issues related to NTSB Recommendations P-90-4 and P-90-5 and the action taken by OPS form a significant part of the bases for this report.

On May 30, 1990, the DOT responded (Appendix F) to some of the NTSB recommendations and will complete the response in the near future.

On October 1, 1990, the NTSB superseded recommendation P-90-4 and issued the following additional recommendations:

- Develop and implement, with the assistance of the Minerals Management Service, the U.S. Coast Guard, and the U.S. Army Corps of Engineers, effective methods and requirements to bury, protect, inspect burial depth of, and maintain all submerged pipelines in areas subject to damage by surface vessels and their operations. (P-90-29)

- Implement permanent measures with the assistance of the Minerals Management Service, the U.S. Coast Guard, and the U.S. Army Corps of Engineers, to increase the coordination and communication between and among Federal and State regulatory agencies, and the pipeline, fishing, and marine industries. (P-90-30)

- Evaluate, with the assistance of the Minerals Management Service, the need for emergency planning and coordination between offshore pipeline operators and producers, and then implement, if necessary, appropriate safety regulations. (P-90-31)

Plans are underway for the Federal agencies to cooperate in implementing these recommendations.

REGULATORY RESPONSIBILITIES

The following governmental agencies currently regulate or have responsibilities that affect offshore pipeline and vessel safety in the Gulf.

Office of Pipeline Safety

The Natural Gas Pipeline Safety Act of 1968 provides for Federal safety regulation of pipeline facilities used in the transportation of natural and other gases. The Hazardous Liquid Pipeline Safety Act of 1979 authorizes the regulation of hazardous liquid pipelines for safety purposes. Both Acts provide a regulatory framework for ensuring pipeline safety and consisting of the following two parts:

(1) exclusive Federal authority to regulate interstate pipelines and facilities, and

(2) Federal responsibility for regulation of intrastate pipelines with provisions for State assumption of all or part of the intrastate responsibility.

Approximately 18,000 miles of offshore interstate natural gas and hazardous liquid pipelines are located on the Outer Continental Shelf (OCS) and approximately 1,000 miles of the pipelines are located in State waters. The OCS is seaward of a line 10.36 miles from the shore of Texas and the Gulf coast of Florida and 3 miles from the shore of other states. The intrastate pipelines located in State waters are regulated by the states. The DOT and DOI established a Memorandum of Understanding (MOU) in 1976, to delineate the extent of each Department's regulatory responsibility regarding pipelines on the OCS. Under the MOU, the OPS has regulatory responsibility for approximately 13,300 miles of pipelines and the MMS has regulatory responsibility for approximately 4,550 miles of pipelines. Over the years, some problems have arisen in determining the boundaries of each Department's jurisdiction under the MOU. The DOT and DOI are reviewing this MOU with the view of possibly revising it to reflect the subsequent enactment of a number of laws relating to the responsibilities of the two Agencies and to better utilize the resources of the RSPA and MMS. This revision would also better define the boundaries of each Department's jurisdiction. The RSPA and MMS would continue to consult and coordinate their regulatory activities to avoid the development of unnecessarily burdensome or incompatible requirements for pipeline owners and operators.

Pipeline safety regulatory functions include developing, issuing, and enforcing regulations for the safe transportation of natural gas, including associated liquefied natural gas (LNG) facilities, and hazardous liquids by pipeline. The regulatory programs are designed to assure safety in the design, construction, testing, operation, and maintenance of pipeline facilities. The program also regulates the siting, construction, operation, and maintenance of LNG facilities. In support of these regulatory responsibilities, OPS manages a grant program to aid States in conducting intrastate gas and hazardous liquid pipeline safety programs. OPS also monitors performance of those States' regulatory programs; analyzes pipeline safety and operating data; and conducts pipeline safety regulation training.

The OPS conducts a pipeline safety technology program with emphasis on applied research. The program supports regulatory decision making and enforcement activities, and provides the foundation necessary for planning, evaluating, and implementing the natural gas and hazardous liquid pipeline safety programs.

The pipeline safety regulations for offshore pipelines (49 CFR Parts 192 and 195) specify the depth to which pipelines must be buried at the time of construction. All new construction of offshore gas and hazardous liquid pipelines in less than 12 feet of water, as measured at mean low tide, must have a minimum of 36 inches of cover (18 inches in consolidated rock). New pipelines in water at least 12 feet deep, but not more than 200 feet deep, must be installed so that the top of the pipe is below the natural bottom unless the pipe is protected by other equivalent means. There is no requirement that the original depth of cover be maintained.

Pipeline operators are required to patrol their lines periodically to observe surface conditions for indications of leaks, construction activities, and other factors and to take corrective action if conditions are unsafe. This offshore patrolling is generally done by aerial patrol as the regulations do not require a physical underwater inspection. However, an underwater inspection may be required during surveillance for unusual operating and maintenance conditions. When an operator learns that a pipeline is unsafe because of its potential to be damaged, the pipeline safety regulations require

that the problem be corrected. Remedial action may include lowering the pipeline, adding more cover over the line, or otherwise protecting it against outside force damage.

With regard to offshore gas and hazardous liquid pipelines abandoned in place, the pipeline must be disconnected from supplies of gas or combustible material, filled with water or inert materials, and sealed at the ends. However, there is no provision for the removal, surveillance, or maintenance of cover over abandoned gas or hazardous liquid pipelines.

U.S. Army Corps of Engineers

The Corps issues permits pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. The regulations are published in 33 CFR Parts 320-330. During the permit application evaluation, those agencies having a particular regulatory interest in a proposed pipeline are furnished a public notice. Any comments made in response to the notice are used in making the decision whether to issue or deny the permit. Occasionally, agencies use that notification to take any special actions that may be needed.

The Corps issues standard permits which go through an individual evaluation and public review process. The Corps also issues nationwide and regional general permits. General permits are developed for specified activities of a similar and minor nature. The general permits undergo the same evaluation and public review process as individual permits; however, if issued, the permits provide for a generic authorization. General permits authorize individual activities through an abbreviated review or without reporting and further review, thus avoiding the need for extensive case by case evaluation. All three of these forms of authorization play a role in regulating pipelines.

The standard permit evaluation process is normally used for those pipelines that cross fairways and anchorages in ocean waters or that cross inland commercial waterways. The Corps nationwide permits are for pipeline backfill (a discharge of dredged or fill material regulated by Section 404 of the Clean Water Act) and for pipelines that are on leases managed by MMS. Regional permits normally are for structures and associated pipelines that do not qualify for the nationwide permit, but are not in areas where the individual review process is determined to be necessary.

Copies of permits for pipelines crossing inland navigable waters are furnished to the NOS for referencing and charting. All permits for pipelines on the OCS include a special condition that requires the permittee to provide notification to NOS prior to beginning work and certified drawings of location and configuration after the pipeline is completed. NOS uses this information in determining what to indicate on its nautical charts. Some pipeline crossings are also indicated on Corps prepared maps or charts of inland navigable waterways through internal coordination of final permit documents.

Corps permits rely on the OPS construction, operation, and maintenance standards, as necessary, to ensure pipelines are built and maintained in a safe manner. Corps permits for pipelines include a standard condition that permittees maintain the permitted portions of the pipelines in good condition and in accordance with the terms and conditions of the permit. The permit condition requiring maintenance in accordance with the approved plans has been a standard condition on all permits since about 1974. Prior to 1974, any maintenance condition would have been added as

a special condition. Owners of the pipelines are and should be responsible for periodic inspections as necessary to ensure compliance with the terms and conditions of the Corps permit. Corps requirements on the burial of offshore pipelines include maintaining the pipeline buried at the specified depths. Corps permits normally require burial of pipelines in the Gulf to a depth of 3 feet in waters less than 200 feet.

The Corps' enforcement and inspection authority is discretionary, and pipelines are only one of many types of activities permitted. Because pipelines have not represented a statistically significant portion of those permits needing oversight, inspections are the primary responsibility of the pipeline owner. The standard condition does not require inspections in terms of specific frequency, but the obligation regarding maintenance is explicit. Maintenance requirements could not be fulfilled without periodic inspections of the permitted pipeline for safety and other purposes. The Corps investigates reported violations and inspects any pipeline identified as a potential problem during the permitting process, or through review of an as-built plan required to be supplied as a condition of the permit. Corps experience has been that owners are willing to correct deficiencies they find or are made aware of, in order to bring the pipeline into compliance with the permit.

If a permittee wishes to abandon a pipeline, the permit conditions allow the Corps to require removal of the permitted portion and restoration of the permit area. Removal is not always necessary or prudent, and through coordination with the Corps, a permittee is granted a modification to the permit that allows abandonment of the pipeline with the liability provisions remaining with the permittee. Reasons for allowing abandonment include concerns about environmental impacts resulting from removal activities as well as extraordinary expenses involved in some removal activities.

Minerals Management Service (MMS)

Regulation of Pipelines

Pursuant to the OCS Lands Act (OCSLA) (43 U.S.C. 1334), MMS issues pipeline rights-of-way on the OCS for the transportation of oil, natural gas, sulphur, or other minerals under such regulations and upon conditions as may be prescribed by the Secretary of the Interior or, where appropriate, the Secretary of Transportation. Under the Act, conditions imposed for granting rights-of-way are to ensure "maximum environmental protection by utilization of the best available and safest technologies, including the safest practices for pipeline burial" and "taking into account, among other things, conservation and the prevention of waste."

Under the general requirements of 30 CFR 250 – Subpart J, a lease term or right-of-way pipeline cannot be installed until an application has been submitted and granted by the MMS Regional Supervisor for Field Operations (RSFO). An application must be submitted to the RSFO and approval obtained prior to the installation, modification, or abandonment of a pipeline and prior to modification or relinquishment of a right-of-way. If the proposed pipeline is not constructed within 5 years of its effective date, the right-of-way grant expires.

A right-of-way holder is responsible for ensuring that the pipeline is constructed in a manner that minimizes deviations from the conditions of right-of-way as granted. However, if it is determined that a deviation from the proposed right-of-way as granted has occurred during construction, the right-of-way holder is required to notify all

affected operators of leases and holders of right-of-way grants that the deviation has occurred. The holder is to provide the RSFO with timely evidence of such notification and must relinquish any unused portion of the right-of-way. A substantial deviation of a pipeline as constructed from the proposed right-of-way as granted, may be grounds for forfeiture of the right-of-way.

MMS carries out inspections at all stages of OCS pipeline operations. Pipeline laying barge activities are inspected to monitor actual pipeline construction specifications including burial activities. Hydrostatic pressure tests are also witnessed and pipeline safety equipment is inspected on a daily basis. During these inspections, MMS has placed special emphasis in monitoring pipeline burial depths to make sure they will not be an obstruction to the other uses of the area.

The RSFO may suspend pipeline operations or a right-of-way grant upon determining that the lessee or right-of-way holder has failed to comply with a provision of the OCSLA or any other applicable law, regulations, or a condition of a permit or right-of-way grant. Also, the RSFO may suspend any pipeline operation upon making a determination that continued activity would threaten or result in serious, irreparable, or immediate harm or damage to life, property, mineral deposits, or the marine, coastal, or human environment.

As a requirement of right-of-way approvals, pipelines must be designed and maintained to mitigate any reasonably anticipated detrimental effects of water currents, storm or ice scouring, soft bottoms, mud slides, earthquakes, subfreezing temperatures, and other environmental factors. If the effects of scouring, soft bottoms, or other environmental factors are observed to detrimentally affect a pipeline, a plan of corrective action is required to be submitted to the RSFO for approval within 30 days of the observation. A report of the remedial action taken is required to be submitted to the RSFO by the lessee or right-of-way holder within 30 days after completion.

Pipelines greater than $8^{5/8}$ inches in diameter and installed in water depths of less than 200 feet are required to be buried to a depth of at least 3 feet, unless they are located in pipeline congested areas or seismically active areas as determined by the RSFO. Nevertheless, the RSFO may require burial of any pipeline upon making a determination that burial will reduce the likelihood of environmental degradation or that the pipeline may constitute a hazard to trawling or other operations.

Pipeline valves, taps, tie-ins, capped lines, and repaired sections that could be obstructive are required to be provided with at least 3 feet of cover, unless the RSFO determines that such items present no hazard to trawling or other operations. A protective device may be used to cover an obstruction in lieu of burial, if it is approved by the RSFO prior to installation.

Under the provisions of Subpart J, the RSFO prescribes time intervals and methods to inspect pipeline routes for indications of pipeline leakage. The RSFO may also require pressure testing of pipelines to verify the integrity of the system when it is determined that there is a reasonable likelihood that the line has been damaged or weakened by external or internal conditions.

Pipeline Rights-of-Way

Applications for the approval of the installation of a lease term pipeline or for the granting of a right-of-way must include the following:

(1) A plat drawn to a specified scale showing major features and other data such as route, water depths, burial depths, etc. The initial and terminal points of the pipeline and any continuation into State jurisdiction must be accurately located even if the pipeline is to have an onshore terminal point.

(2) A schematic drawing showing the size, weight, grade, and wall thickness of pipelines and risers, and safety equipment such as shut down valves, flow safety valves, block valves, etc. This schematic drawing also shows input source(s), e.g., wells, pumps, compressors, and vessels, etc.

(3) General information such as cathodic protection system, external pipeline coating system, maximum allowable operating pressure and other similar pertinent information.

(4) A description of any additional design precautions taken to enable the pipeline to withstand the effects of water currents, storm or ice scouring, soft bottoms, mudslides, earthquakes, permafrost, and other environmental factors.

(5) A shallow hazards survey report and, if applicable, an archaeological resource report which covers the entire length of the pipeline.

Where the proposed route of a right-of-way adjoins and subsequently crosses any State submerged lands, the applicant is required to submit evidence to the RSFO that any State affected has reviewed the application. The applicant must also submit any comments received as a result of the State's review. In the event of a State recommendation to relocate the proposed route, the RSFO may consult with the appropriate State officials.

In considering an application for a right-of-way, the RSFO is required to prepare an environmental analysis to consider the potential effect of the associated pipeline on the human, marine, and coastal environments, life, property, and mineral resources in the entire area during construction and operational phases. To aid in the evaluation and determinations, the RSFO may request and consider views and recommendations of appropriate Federal agencies, hold public meetings after appropriate notice, and consult with State agencies, organizations, industries, and individuals. Before granting a pipeline right-of-way, the RSFO is required to give consideration to any recommendation by the intergovernmental planning program, or similar process, for the assessment and management of OCS oil and gas transportation.

If a lease term or right-of-way application and other required information are found to be in compliance with applicable laws and regulations, the application may be approved. The RSFO may prescribe, as conditions to a right-of-way grant, stipulations necessary to protect human, marine, or coastal concerns, and mineral resources located on or adjacent to the right-of-way.

Abandonment

Once a pipeline is placed out of service, it must be abandoned within a certain time frame. The time frame for abandonment depends upon the type of pipeline (lease or right-of-way).

Upon relinquishment, forfeiture, or cancellation of a right-of-way grant, the right-of-way holder is required to remove all platforms, structures, domes over valves, pipes,

taps, and valves along the right-of-way. Removal is to be completed by the holder within one year of the effective date of the relinquishment, forfeiture, or cancellation, unless the requirement is waived in writing by the RSFO. The holder is responsible for accidents or damages which might occur as a result of failure to remove improvements. All improvements not removed within one year become the property of the United States. However, this does not relieve the holder of liability for the cost of their removal or for restoration of the site.

Unless the RSFO determines that such a procedure is not practical, abandoned pipelines to be removed are required to be pigged (scraped and cleaned on the inside by a special tool) and flushed with water prior to removal. Lease term pipelines must be abandoned after being out of service for more than 5 years or within one year of the lease expiration.

If the RSFO determines that an abandoned pipeline will not constitute a hazard to navigation, interfere with commercial fishing operations, or unduly interfere with other uses in the OCS, the RSFO may waive the requirement for removal of all structures, etc., allowing the pipeline to be abandoned in place. Pipelines abandoned in place are required to be flushed, filled with seawater, cut, and plugged with the ends buried at least 3 feet. If pipelines abandoned in place become an obstruction after abandonment, the lessee or right-of-way holder may be required to remove or rebury the line.

National Oceanic and Atmospheric Administration (NOAA)

The NOS produces charts and related information for the safe navigation of marine and air commerce (33 U.S.C. 883 a, b). NOS charts are required by regulations (33 CFR 146) to be used aboard all vessels of 1,600 gross tons or more when operating in the navigable waters of the United States. These charts are widely distributed and used by many boaters and mariners not otherwise required by law to use them.

Pipelines are depicted on these charts based on information provided by permitting agencies. The Corps is required by 33 CFR 209 to provide NOS with copies of all permits issued for submerged cables and pipelines. MMS, other Federal agencies, States, private companies, and other organizations also provide information to NOS. Submerged pipelines are classified for charting according to whether their contents are volatile (shown on the chart in magenta) or non-volatile (shown in black). The coastal series of charts (1:80,000 scale) contain the greatest amount of pipeline information in the shallow offshore waters of the Gulf. These charts are typically revised on a two-year cycle. Information which is of importance to the mariner and arises in the interim between chart editions is disseminated by the Coast Guard through the Local Notices to Mariners.

U.S. Coast Guard

The Ports and Waterways Safety Act (33 USC 1221), tasks the U.S. Coast Guard with the responsibility of ensuring navigation safety. Two offices within the Coast Guard share this responsibility. The Office of Merchant Marine Safety, Security, and Environmental Protection oversees commercial vessel inspection, investigation of marine casualties, licensing of merchant marine personnel, port safety and security, and pollution prevention and response. The Office of Navigation Safety and Waterway

Services has responsibility for notices to mariners, aids to navigation, and vessel traffic management such as shipping safety fairways, traffic separation schemes, and vessel traffic services or VTS. The thrust of these two program areas is oriented toward U.S. port safety and regulating the operation, manning, movement, and equipment of vessels operating in U.S. waters.

With regard to pipeline safety, the Coast Guard provides periodic review and comment on pipeline permit proposals submitted by other Federal agencies (MMS and the Corps). Though the Coast Guard has no direct regulatory authority over the design, installation, and inspection of pipelines, it is very instrumental in providing mariners with specific pipeline hazard information. Once pipeline hazard information is made available to the Coast Guard, there are several means to advise mariners of a particular pipeline hazard. The most common approach is a notice to mariners.

The notices to mariners are the way the Coast Guard disseminates information affecting navigation safety. The information concerns aids to navigation, obstructions, channel depths, naval operations, and dredging operations. On a weekly basis, each Coast Guard district publishes a Local Notice to Mariners. Each of the notices contains information concerning the waterways within the district. The information is received from Coast Guard units, NOAA vessels, NOS, other Federal and State agencies, and the general public. These notices are essential to all mariners desiring to keep their nautical charts and nautical publications up-to-date.

When navigation safety information is received and requires immediate dissemination, a Coast Guard Broadcast Notice to Mariners is made. The broadcasts are issued by radio, upon receipt and at regular intervals thereafter.

In addition to providing navigation safety information, the Coast Guard can take active steps to control the movement of vessels in response to a specific hazard. In order to ensure navigation safety within the territorial waters of the U.S. (3 nautical miles), the Coast Guard district commander or the local Coast Guard Captain of the Port can establish a safety zone in the vicinity of the hazard. Vessel operations within this zone can be controlled by limiting vessel drafts, speeds, anchoring, delineating traffic lanes, or by preventing vessels from entering the zone. Safety zones are established as a temporary measure to ensure navigation safety. Safety zones are typically established to allow emergency dredging operations, to prevent vessels from disturbing clean up operations from oil/chemical spills, or, in the case of a specific pipeline hazard, to control vessel movements through an area until the hazard can be corrected.

Both the notice to mariners and the establishment of safety zones are effective methods by which the Coast Guard can advise and direct mariners away from specific pipeline hazards. However, neither of these methods is a substitute for the prudent mariner's responsibility to maintain up-to-date nautical charts, to fix the vessel's position on the chart, and to obtain local navigation knowledge. The prudent mariner is also responsible for maintaining and using navigational references such as the Coast Pilot, the Navigation Rules, and the Tide Tables.

With this in mind, the Coast Guard has traditionally upheld the position that navigation rules and regulations are established as a framework within which navigation safety can be maintained. Similarly, the Coast Guard relies upon the judgment and professionalism of prudent mariners, since no degree of regulation can be a substitute for a mariner's experience, good judgment, and professionalism. A part of the professional mariner's responsibility includes keeping abreast of navigation safety

concerns through the notice to mariners and maintaining, updating, and referencing the applicable charts for their area of operation.

Louisiana Office of Conservation (LOC) – State of Louisiana

The LOC is a certified agency of the OPS regarding intrastate pipeline safety and has adopted and enforces the Federal pipeline safety standards for intrastate gas pipelines in offshore State waters (3 miles). In 1985, the Louisiana Underwater Obstructions Regulations were adopted in response to a growing number of incidents involving collisions between fishing or shrimping vessels (or their gear) and submerged pipelines, wells, platforms and similar structures, many of them apparently abandoned. The regulations require:

(1) a permit for construction of any new facility;

(2) construction of new facilities so as to minimize obstructions to navigation;

(3) burial of all new lines (including flow lines) to a depth of 3 feet where located in less than 20 feet of water;

(4) notification by responsible parties when facilities are abandoned;

(5) removal within 90 days of abandonment of all non-buried facilities (except flow lines) located in less than 20 feet of water;

(6) marking of unburied flow lines left in place after abandonment in less than 20 feet of water;

(7) implementation of remedial action when ordered by LOC to bring a facility into compliance with the foregoing requirements.

The concerns of the LOC with regard to abandoned pipeline facilities have merit. The hazards to public safety and navigation from these abandoned facilities should be remedied.

Railroad Commission of Texas (RRC) – State of Texas

The RRC is a certified agency of the OPS regarding intrastate pipeline safety. The commission has adopted and enforces the Federal pipeline safety standards for intrastate gas pipelines in offshore State waters. The Texas state limit is 3 marine leagues or approximately 10.36 miles. The RRC issues permits for companies to operate pipelines in Texas, including the offshore area. The Texas General Land Office (GLO) grants easements to the operators. Both agencies obtain their authority from the Texas Natural Resources Code. Although the State of Texas does not have an obstruction law, the GLO has a provision in their contract for pipeline operators to remove any personal property, structures, and man-made improvements within 120 days of cancellation of the easement.

FISHING VESSEL OPERATIONS

Fishing vessels like the NORTHUMBERLAND, engage in purse seine fishing operations for menhaden. The menhaden is a fish of the herring family common to the U. S. east and Gulf coasts. The fish is rich in oil and nitrogen, and is caught in large numbers for use as bait, animal feed, and fertilizer. Menhaden are not caught commercially for human consumption. The menhaden fishery is the most important fishery in terms of volume in the Gulf of Mexico and it is second only to shrimp in importance in terms of value.

Purse seine fishing operations are conducted by two small "purse boats" which are carried on board a larger mother ship. Purse boats are motor propelled and are used to set the purse seine fishing net in the water to entrap a school of fish. One half of the purse seine net is typically stowed in each purse boat. The two purse boats operate side by side in the water as they approach a school of fish. At an appropriate distance from the fish, the boat operators maneuver their boats in opposite directions while streaming the net astern following a circular track. The two boats come together again when the circle is completed, entrapping the school of fish within the net.

After the purse boats trap the school of fish within the net, the net is then hauled in, using hydraulically operated machinery (power blocks) on board the purse boats. As the net is hauled in, the fish are concentrated into a smaller and smaller area.

After this operation is completed, the mother ship maneuvers alongside the net and the purse boats tie up to the mother ship amidships. Due to the resistance of towing the large, fish-filled net, the purse boats cannot move the net to the mother ship; therefore, the mother ship must come to the net. Once the purse boats are secured to the mother ship, a flexible hose is inserted into the net and the fish are pumped aboard the mother ship by a centrifugal pump. During the pumping process, the fish are separated from the water that is pumped aboard with the fish. The water is discharged overboard, while the fish are directed into the appropriate fish hold.

As set forth previously, fishing vessels fish from shallow waters close to the beach to as far as 20 miles offshore. However, about 50 percent of the fish are caught within one mile of shore. Many companies do not specify a minimum water depth into which the captain of the vessel may take the vessel. It is common practice for vessel captain's to fish wherever and at whatever water depth they deem necessary to catch fish. This practice commonly results in vessels coming into contact with the sea bottom and navigating through the soft mud during fishing operations in the Gulf. Because of this, exposed submerged pipelines pose a particular risk to fishing vessels. Exposed submerged pipelines also pose a hazard to other vessels such as offshore supply vessels and recreational craft that operate in the near-shore shallow environment.

The Coast Guard is very much aware of the hazards of the fishing industry. As part of an ongoing effort to study the hazards of the fishing industry, the Coast Guard has established the Commercial Fishing Industry Vessel Advisory Committee. The Council has been instrumental in assisting the Coast Guard with establishing fishing vessel safety regulations pursuit to Public Law 100-424 (Commercial Fishing Industry Vessel Safety Act of 1988). This Act and the regulations which will implement it, provide additional safety requirements for vessels engaged in commercial fishing operations.

The Coast Guard is in the process of drafting the final rules to implement this Act. The new regulations will propose that every uninspected vessel, which is a fishing vessel, fish processing vessel, or fish tender vessel, operating beyond the boundary

line or that operates with more than 16 individuals on board, to maintain and use navigation equipment, including nautical charts. The boundary line in the Gulf of Mexico runs along the 12-mile line marking the Contiguous Zone. These proposed regulations should significantly improve overall fishing vessel safety in the U.S.; however, they will have only limited effect on these vessels such as menhaden fishing vessels, which routinely operate inside the boundary line with crews of less than 16 persons. Hence those fishing vessels under the greatest risk of striking submerged pipelines, will not be required to carry charts which may assist them in avoiding pipeline hazards in the Gulf.

INSPECTION TECHNOLOGY

The MMS in coordination with NOS's Office of Charting and Geodetic Services, surveyed geophysical and other companies to determine the availability of inspection methods and technology for the detection of offshore pipeline location and burial depth. Techniques of interest are for the inspection of buried pipelines, rather than pipelines that are exposed above the ocean floor which can be checked by a side-scan sonar or a high resolution multi-beam sonar. (Side-scan or multi-beam sonars are more effective in deeper waters with calm seas.) In contacting several geophysical companies, primary emphasis was placed on the techniques available for inspections to locate buried pipelines in shallow water (0-15 feet) and determine the depth of burial. The following are the three basic techniques available for the inspection of pipelines.

Physical Probe

Physical probing is the simplest technique available and probably the best technique in extremely shallow water (less than 3 feet). This type of inspection is generally done by divers and is a slow and costly process, especially in the deeper waters (15-200 feet). There are three different variations of probing; the standard stick probe, the jet stick probe, and an electronic detector (radio detection) which requires no physical soil penetration. The first two types of probing are the "ground truth" (baseline) for all remote sensing techniques, but are not required for remote sensing.

Acoustic Systems

Acoustic inspection techniques involve the towing of instrumentation on or below the water surface. This type of surveying is used extensively throughout the world for the location and burial determination of pipelines, but is limited in its effectiveness by water depth and sea bottom material. This technique will detect buried pipe in the North Sea, but due to the biogenic content of the western Gulf and the granular sands of the eastern Gulf, acoustic penetration may be limited. An additional constraint for the use of this technique is the lack of penetration where a pipeline has been covered with shells or gravel.

Magnetic Systems

These systems are generally dragged at or near the bottom and offer the greatest detection potential. The simple system which consists of a single magnetometer or gradiometer will indicate the presence of the pipe, but not the exact location. A more complex system of three gradiometers allows for the horizontal and vertical separation between the sensors and the pipeline. With the addition of the other two sensors, the depth of cover can be determined. However, a large remotely operated vehicle (ROV) is required, thus limiting the operation to a minimum water depth of about 15 feet. Also, in order to obtain valid depth of cover readings, the pipe must be under the center of the sensor.

DEVELOPMENT

External Systems

Surveying companies are working on ways of solving the shallow-water limitations of surveying equipment. Modifications to acoustic systems are being designed and tested to improve system operation in shallow waters so they could be used in areas of the Gulf where soil conditions will allow reliable results.

Pulse induction technology is being used in an attempt to solve the problem of having to stay on top of the pipeline. This system utilizes pulse induction and monitors the decay of the magnetic field after the pulse to detect any type of conductive material. By being an active system, its detection envelope should be larger and thus relax the stringent station-keeping requirements of other systems. An alternative active system would be that of a cathodically or impressed current protected pipeline. Tracking range for some of this equipment is determined by the diameter of the pipeline. Reportedly, a 4-inch pipeline can be tracked accurately to a burial depth of 10 feet; a 16-inch pipeline to a depth of 20 feet; and a 46-inch pipeline to a depth of 30 feet.

On August 1, 1990, a member of this task force attended a trial test near Cameron, Louisiana, of a shallow-water inspection of a 36-inch concrete coated pipeline conducted by John E. Chance and Associates, Inc. (JECA). For this demonstration of a pipeline inspection system, the pipeline was physically probed and marked from the beach to a depth of 5 feet of water. The sensing equipment was mounted on a tow sled and pulled at right angles over the pipeline in a crossing mode as opposed to a longitudinal mode because crossing is physically easier to achieve for shallow-water pipeline inspections. The initial shallow-water test using Innovatum Sensing Equipment by JECA gave good results in detecting the pipeline and measuring burial depth. Other test runs were scheduled to improve the accuracy of the burial depth as determined by probing. An advantage of this system in deep water is that a complete pipeline burial depth profile can be run in the longitudinal mode instead of a spot check inspection. For shallow-water, a longitudinal inspection can be achieved by using a "crawler" vehicle. Also, the use of an integrated system will enhance the inspection of other aspects of a pipeline such as cathodic protection profile and updated information on the present location.

Internal Systems

Internal inspection devices called 'pigs' are propelled through a pipeline by the commodity being transported to provide information on the condition of the pipeline. Currently pigs are used to detect corrosion or deformation of the pipeline. There are some active developments under way using a pig to measure the burial depth from within the pipeline. This system is potentially the least expensive inspection technique. However, one drawback of this system is that if the measuring device becomes lodged it could be difficult to remove in offshore waters.

RECORD KEEPING

Information on pipelines is required to be submitted to the Federal government agencies in order to obtain necessary construction permits and operating licenses. Record keeping and data management procedures differ between the various agencies involved with submerged pipelines. They may be systematic or ad-hoc, centralized or decentralized, computerized or manually filed. Information collected by permitting agencies may or may not be available to other users. This process is administered by three Federal agencies: the Corps, MMS, and OPS.

Corps permits are required for structures, including pipelines, that affect the navigable waters of the United States (33 CFR 322). Permits for pipelines are required to carry the condition that an as-built drawing certifying the location and information of the completed pipeline be submitted to the NOS for consideration and appropriate application to nautical charts (33 CFR 325, App. A). This transfer of information, although required by Federal regulations, may not always take place.

Most of the authority for administering the regulatory program of the Corps has been delegated to the district and division engineers. Final decisions on permit applications for submerged pipelines are made by the district or division engineer. Records are kept by the district or division. These records are not systematically compiled into maps or a data base. Some pipeline crossings are indicated on the Corps-prepared maps or charts of inland navigable waterways. Copies of permits and drawings of completed pipelines are required to be submitted to NOS for application to nautical charts.

Construction and operation of pipelines on the OCS are under the jurisdiction of the MMS (30 CFR 250). Applications for rights-of-way and permits which authorize the installation of pipelines require submission of information on the proposed location, connections, and use, as well as detailed design characteristics and route survey reports (30 CFR 250.157). The lessee or right-of-way holder is required to provide as-built drawings upon completion, to report interruptions in service, and to describe any repairs and tests performed (30 CFR 250.158). When the effects of scouring, soft bottom, or other environmental factors are observed to be detrimentally affecting a pipeline, a plan of corrective action must be submitted to the MMS for approval. Right-of-way holders are also required to make available for inspection by MMS, all records relative to the design, construction, operation, maintenance, repair, and investigations of their pipelines (30 CFR 250.159). There are no similar requirements for pipelines originating in State waters.

The pipeline records maintained by the MMS include a complete file of specifications for each pipeline segment including information from the time the pipeline was approved to the time it was abandoned. Information pertaining to pipeline modifications, repairs, and other pipeline crossings are maintained in the pipeline files.

A computerized pipeline data base, containing an inventory of all pipeline segments in the OCS, is maintained by the MMS Gulf of Mexico Regional Office. Information such as originating and ending point, operator, size, product, burial, length, approval date, and construction date as well as other information is all maintained in the pipeline data base system.

Operators of hazardous liquid pipelines are required by 49 CFR 195.404 to maintain current maps and records of their pipelines. These must indicate the location and identification of principal pipeline components, crossings of foreign pipelines, the maximum operating pressure of each pipeline, and the diameter, grade, type, and nominal wall thickness of all pipe. Except for a requirement under 49 CFR 192.491 to record the location of cathodically protected piping, gas pipeline operators are not subject to a maps-and-records rule. As required by the Pipeline Safety Reauthorization Act of 1988 (Public Law 100-561), the OPS plans to initiate rulemaking action in the near future by proposing that the hazardous liquid pipeline requirements be extended to cover gas pipelines, that additional information on pipeline characteristics, repairs, inspections and tests be maintained, and that portions of this information be submitted annually to OPS with other information available, upon request, to OPS or a State pipeline safety agency.

A data base printout which lists pipelines crossing the Federal/State boundary line has been provided by MMS to the OPS. In addition to this printout, a copy of an MMS study titled "Pipelines, Navigation Channels, and Facilities in Sensitive Coastal Habitats", Volume I (OCS Study MMS-0051, October, 1989) and Volume II (OCS Study MMS-0052, October 1989), was provided to OPS in order to help in the identification of pipelines outside the OCS. Appendices A.1-A.4 of Volume I list the Federal OCS pipelines making landfall in areas from Alabama to Texas. Maps A-1 through A-8 of Volume II sketch the location of the pipelines at an approximate scale of 1:1,000,000. MMS also provided a map at an approximate scale of 1:800,000, titled Historic Leasing and Infrastructure (Visual No. 1, November 1989) showing pipelines in the Gulf as of March 1987, but with a disclaimer of liability.

MAPPING AND CHARTING OF SUBMERGED PIPELINES

Maps, charts, and other records of submerged pipelines are used by governmental agencies for several reasons:

(1) In the permitting process, to identify constraints which may affect the proposed construction;

(2) In emergencies, to coordinate response;

(3) In aiding the safety of navigation (depicting pipelines on nautical charts made available to mariners); and

(4) In determining the ownership of pipelines and related structures for purposes of requiring reburial or other remedial action pursuant to OPS regulations.

Responsibilities for these functions are divided among several Federal and State agencies. Their requirements for pipeline data are similar but not identical. The collection of information on the location of offshore pipelines is divided among three Federal agencies; the Corps, MMS, and OPS. By virtue of its permitting program for all offshore structures, the Corps in principle has complete information for these facilities. MMS also has complete information on the location of pipelines on the OCS. However, there is no central clearing house for this information. The agencies do not utilize uniform technologies or data management procedures, thus making it difficult for such information to be effectively compiled and pipeline locations to be accurately mapped.

While NOS has created charts showing the locations of major pipelines, these charts do not include the locations of all intrastate pipelines. It appears that NOS does not receive full information from the other agencies, particularly the Corps.

MMS has a complete pipeline file for the Gulf OCS. This file consists of maps, records, and a data base. MMS has no jurisdiction and thus no official records for pipelines that are not located on the OCS. All pipelines on the OCS are plotted on maps maintained by the MMS Gulf of Mexico OCS Regional Office (Appendix G). A gulf-wide index map at a scale of 1" = 40,000' (1:480,000), shows the division of the Gulf into areas of six lease blocks each. A coverage map showing proposed and existing pipelines, at a scale of 1" = 2,000' (1:24,000), is maintained for each of these six block areas. The information used to plot the pipelines on the coverage maps is the proposed route submitted with the permit application. Each pipeline is identified by operator, size, and product.

Coverage maps are manually updated when the as-built drawing is submitted with the completion report. As of this date, 702 pipeline coverage maps are being maintained. All of these maps are available and are frequently requested by the general public as well as oil and surveying companies.

The Louisiana Geological Survey, with the assistance of the Louisiana State University, is digitizing the location of all pipelines located in the State of Louisiana and in offshore waters out to 3 miles from the Louisiana coastline. Louisiana's digitization project is designed to meet National Map Accuracy Standards at a scale of 1:24,000. The project is scheduled to be completed by August 1991, but completion may be delayed for approximately one year. Previous mapping efforts, including an Intrastate Pipeline Map and a 1981 map depicting interstate offshore and onshore oil and gas pipelines, are of limited accuracy and are outdated.

The Texas RRC is developing a computerized mapping system for state offshore waters which will include pipeline data. The base map data will be obtained from the U.S. Geological Survey's 7.5 minute (1:24,000 scale) topographic quadrangle maps. The RRC, using permits from the Texas General Land Office and its Oil and Gas Division will add data on pipelines, wells, platforms, lease boundaries, and related facilities. The initial phase of the offshore effort was to generate a Nueces County, Corpus Christi Bay map as part of the Governor's Oil Spill Response Program. Work is now being done on Galveston County and work will continue along the coastal waters to complete the Texas coast. The estimated completion date for the entire Texas mapping project is December 1994.

NOS produces more than 100 nautical charts covering areas in the Gulf at scales ranging from 1:10,000 to 1:2,160,000. These charts are intended as aids for safe marine navigation. The Federal government accepts liability for the accuracy of these charts. NOS information on which to base charting of pipelines is obtained entirely through other organizations and agencies. Certified as-built drawings, with accuracy of better than one millimeter at the scale of the chart, are required. At the present time, this information is filed and applied to the charts manually. A new Automated Nautical Charting System II (ANCS II) is under development and will track source documents, manage the charting data base, and produce chart graphics.

The present policy is to chart selected, large flow pipelines on the coastal series of charts (1:80,000), with smaller scale charts showing selected pipelines beyond the coverage of the coastal series. The coastal charts cover the complete Gulf area from the shoreline to approximately 20 nautical miles offshore and are revised on an approximately two-year cycle. NOS cartographers exercise discretion in order to avoid clutter which can obscure vital navigation information on the nautical charts. A review of current practice showed:

(a) Most (85% of 164) of the pipelines reported by the MMS as originating in the OCS, crossing the Federal/State boundary, and terminating on shore are charted.

(b) No pipelines are shown as originating in State waters. No estimate is available of the actual number of pipelines in this area. The NTSB reported an estimate, provided by the RRC, that there are 70 pipeline systems and 600 miles of pipeline under the jurisdiction of the RRC. The LOC has estimated that there are approximately 20 miles of intrastate pipelines in Louisiana state waters.

(c) No pipelines in internal waters are depicted on the charts; however the charts carry the following cautionary note:

> "Additional uncharted submerged oil and gas pipelines may exist within the area of this chart."

Several private sector organizations, including PennWell Books, the Oil Pipeline Research Institute, and John E. Chance and Associates (JECA), assemble information on submerged pipelines in the Gulf. The data base maintained by JECA is automated and believed to be the most complete data base for the Gulf. Initial comparisons between plots generated from this data base, NOS charts, and an RRC map showed the following variations:

(a) Most small lines (less than eight inches in diameter) are not depicted on NOS' coastal series charts. They generally form very congested areas at this scale (1:80,000), but could be depicted as "pipeline areas" on the chart.

(b) More than half (28 of 49) of the pipeline segments larger than eight inches in diameter that are in the JECA data base are not shown on the NOS chart selected for comparision. Most of these are short segments. The percentage of pipeline miles that are in agreement would be higher. Two of the lines differ in plotted location by more than one-half nautical mile from the JECA plot.

(c) All the pipelines in the JECA data base which do not originate in the OCS, and are greater than eight inches in diameter are plotted on the RRC map. There are differences in plotted positions of up to one-quarter nautical mile.

(d) The RRC map shows 18 of the 28 smaller pipelines in State waters that appear in the JECA data base plus two that do not. There are position differences of up to one nautical mile. Both the RRC map and the plot from the JECA data base show suspicious fragmentation of pipelines and lack an obvious relationship to wells and platforms.

Since the initial comparison of the plots, the RRC has been verifying the pipeline data. Review of pipeline permits and survey lines has resulted in more accurate locating and mapping of offshore pipelines in State waters.

SUMMARY OF FINDINGS

- It is clear from the accidents involving fishing vessels and submerged pipelines, that exposed pipelines pose a potential risk to navigation safety, especially for mariners operating in the shallow near-shore waters.

- Abandoned pipelines also pose a potential risk to navigation safety.

- Hurricanes can accelerate the erosion of coastal lands significantly and cause an offshore pipeline to become exposed on the ocean bottom.

- Underwater inspections of offshore pipelines have not been performed. To reduce the likelihood of further casualties, pipeline owners and operators should inspect these pipelines (including abandoned pipelines) at regular intervals and exposed pipelines should be re-buried.

- There are presently two operational systems, the magnetic system and the physical probe available for the detection of pipeline location and burial depth in offshore waters. Additional development is underway on acoustic systems and the pulse induction technology. Internal systems such as the internal inspection "pigs" to determine offshore burial depth are in the initial stages of development and require further testing. Cost estimates for inspections vary with probing being the most expensive and internal inspection potentially being the least expensive. Industry supported testing and development has increased and should improve the capability and performance of inspections, and reduce costs.

- All of the burden must not be placed on the pipeline owner/operators. Vessel operators, in an effort to protect themselves and their crews, must make changes in the manner in which vessels are operated, including a greater use of prudent seamanship.

- Offshore pipelines are not adequately mapped or charted. Where pipelines are mapped and charted, the information between Federal agencies, State agencies, and private industry differs. Nautical charts depicting submerged pipelines can enhance navigation safety but construction of these charts requires data that is accurate and complete as the government accepts liability for the charts.

- Greater coordination between Federal and State government agencies regarding information on offshore pipelines is essential to ensure adequate data bases and maps of offshore pipelines.

- Development of a data base on the location, condition, configuration, and status of offshore pipelines is essential to meeting the agency requirements. Handling of the data base can logically be divided into a mapping portion and a descriptive portion with keys to link the two.

- Greater coordination between government agencies regarding offshore pipeline regulations and permits is essential to eliminate overlapping jurisdictions, and to assure coordinated and similar requirements for offshore pipelines.

- Once the pipelines are adequately charted, the use of charts by vessels would improve the mariner's awareness of the location of offshore pipelines when navigating or when using bottom dragging equipment in shallow waters.

RECOMMENDED ACTIONS

- All agencies should improve and coordinate their efforts to accurately determine the location and ownership of all pipelines in both Federal and State waters in the Gulf of Mexico.

- The OPS should propose regulations concerning the burial and surveillance of offshore pipelines to incorporate the requirements of the pending pipeline safety legislation and the findings of this report.

- The OPS should work with the MMS to better define their respective jurisdictions regarding pipelines on the OCS to preclude overlapping jurisdiction and overlapping regulations.

- A single geographic data base to meet the mapping needs should be developed and made accessible to all the agencies involved. The types of descriptive data, such as status, materials, contents, repair histories, etc., that must be tracked differs between the agencies and should be managed individually. Pipeline segments should be uniquely identified to correlate the mapping data with the descriptive data.

- All agencies should work with NOS and other agencies involved in establishing a policy and/or regulation change to ensure that all new as-built pipeline information is submitted to NOS for determination of whether a particular pipeline should be depicted on nautical charts. Additionally, all agencies should work with NOS to bring up-to-date the navigational charts as far as the existing pipelines are concerned and to investigate the discrepancies discovered during the review of existing mapping information with emphasis on updating the coastal series charts.

- Consideration should also be given to the question of geographic extent of these efforts. While the accidents occurred on offshore pipelines in the Gulf, other recent incidents (such as in Arthur Kill, New York Harbor) have involved submerged pipelines in internal waters and in other parts of the country. While offshore oil and gas pipelines are largely limited to the Gulf at present, there are numerous pipelines in internal waters and many offshore pipelines in other geographic locations that should be considered in the development of regulations.

- The dialogue regarding the safety of offshore pipelines and marine vessels should be continued with periodic meetings of local agencies in the Gulf area.

Natural Gas Transmission and Gathering Incidents
occurring offshore since 7/1/84

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REPORT ID	COMPANY NAME	INCIDENT DATE	DEATHS	INJURIES	CAUSE
840864	PHILLIPS PETROLEUM CO	06/14/1984	0	0	OTHER
840973	UNITED GAS PIPELINE CO	09/09/1984	0	0	CORROSION
841072	TRANSCO GAS PIPELINE CORP	12/02/1984	0	0	CONSTRUCTION/MATERIAL DEFECT
841080	NATURAL GAS PIPELINE CO OF AMERICA	10/27/1984	0	0	CORROSION
841112	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	12/12/1984	0	0	DAMAGE BY OUTSIDE FORCES
841116	STINGRAY PIPELINE CO	12/22/1984	0	0	DAMAGE BY OUTSIDE FORCES
850011	BLACK MARLIN PIPELINE CO	01/04/1985	0	0	OTHER
850043	NATURAL GAS PIPELINE CO OF AMERICA	01/18/1985	0	0	CORROSION
850060	NORTHERN NATURAL GAS CO	12/17/1984	0	0	CONSTRUCTION/MATERIAL DEFECT
850111	TRUNKLINE GAS CO	03/25/1985	0	0	CONSTRUCTION/MATERIAL DEFECT
850143	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	04/25/1985	0	0	OTHER
850152	SOUTHERN NATURAL GAS CO	04/12/1985	0	0	DAMAGE BY OUTSIDE FORCES
850207	BLACK MARLIN PIPELINE CO	06/11/1985	0	0	CORROSION
850228	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	06/25/1985	0	0	CORROSION
850279	NATURAL GAS PIPELINE CO OF AMERICA	09/09/1985	0	0	DAMAGE BY OUTSIDE FORCES
850281	SOUTHERN NATURAL GAS CO	08/30/1985	0	0	DAMAGE BY OUTSIDE FORCES
850283	SEA ROBIN PIPELINE CO	09/01/1985	0	0	CONSTRUCTION/MATERIAL DEFECT
850290	SEA ROBIN PIPELINE CO	10/16/1985	0	0	DAMAGE BY OUTSIDE FORCES
850293	TRUNKLINE GAS CO	10/27/1985	0	0	DAMAGE BY OUTSIDE FORCES
850306	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	11/04/1985	0	0	OTHER
850315	EXXON CO USA	12/13/1985	0	0	OTHER
860039	COLUMBIA GULF TRANSMISSION CO	01/15/1986	0	0	DAMAGE BY OUTSIDE FORCES
860115	BLACK MARLIN PIPELINE CO	05/31/1986	0	0	CONSTRUCTION/MATERIAL DEFECT
860123	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	05/28/1986	0	0	CONSTRUCTION/MATERIAL DEFECT
860174	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	08/20/1986	0	0	CORROSION
870004	SEA ROBIN PIPELINE CO	11/24/1986	0	0	DAMAGE BY OUTSIDE FORCES
870008	STINGRAY PIPELINE CO	11/26/1986	0	0	CORROSION
870024	VALERO TRANSMISSION CO	12/30/1986	0	0	DAMAGE BY OUTSIDE FORCES
870044	STINGRAY PIPELINE CO	02/13/1987	0	0	CORROSION
870047	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	02/02/1987	0	0	CONSTRUCTION/MATERIAL DEFECT
870050	STINGRAY PIPELINE CO	02/01/1987	0	0	CORROSION
870078	NATURAL GAS PIPELINE CO OF AMERICA	01/13/1987	0	0	CORROSION
870094	EXXON CO USA	05/13/1987	0	0	OTHER

Natural Gas Transmission and Gathering Incidents
occurring offshore since 7/1/84

REPORT ID	COMPANY NAME	INCIDENT DATE	DEATHS	INJURIES	CAUSE
870142	UNITED TEXAS TRANSMISSION CO	07/22/1987	0	0	CORROSION
870146	TENNESSEE GAS PIPELINE CO	09/11/1987	0	0	DAMAGE BY OUTSIDE FORCES
870157	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	08/20/1987	0	0	CORROSION
870184	STINGRAY PIPELINE CO	09/10/1987	0	0	DAMAGE BY OUTSIDE FORCES
870204	TRANSCO GAS PIPELINE CORP	10/22/1987	0	0	DAMAGE BY OUTSIDE FORCES
870216	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	11/02/1987	0	0	DAMAGE BY OUTSIDE FORCES
880110	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	03/11/1988	0	0	DAMAGE BY OUTSIDE FORCES
880124	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	03/21/1988	0	0	CORROSION
880157	BLUE DOLPHIN PIPELINE CO	06/10/1988	0	0	CORROSION
880159	TENNESSEE GAS PIPELINE CO	05/25/1988	0	0	DAMAGE BY OUTSIDE FORCES
880208	SOUTHERN NATURAL GAS CO	09/11/1988	0	0	DAMAGE BY OUTSIDE FORCES
880211	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	09/10/1988	0	0	CORROSION
880214	TENNESSEE GAS PIPELINE CO	09/17/1988	0	0	DAMAGE BY OUTSIDE FORCES
880225	TENNESSEE GAS PIPELINE CO	09/01/1988	0	0	CONSTRUCTION/MATERIAL DEFECT
880269	CHEVRON USA INC	08/20/1988	0	0	CORROSION
880275	TENNESSEE GAS PIPELINE CO	11/12/1988	0	0	DAMAGE BY OUTSIDE FORCES
880311	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	11/17/1988	0	0	DAMAGE BY OUTSIDE FORCES
890022	NATURAL GAS PIPELINE CO OF AMERICA	12/07/1988	0	0	CORROSION
890039	TENNESSEE GAS PIPELINE CO	01/20/1989	0	0	CORROSION
890041	CHEVRON USA INC	01/11/1989	0	0	CORROSION
890061	BLUE DOLPHIN PIPELINE CO	02/24/1989	0	0	CORROSION
890076	SOUTHERN NATURAL GAS CO	02/28/1989	0	0	DAMAGE BY OUTSIDE FORCES
890104	SOUTHERN NATURAL GAS CO	03/19/1989	7	10	OTHER
890114	ANR PIPELINE CO (AMERICAN NATURAL RESOURCE)	03/08/1989	0	0	CONSTRUCTION/MATERIAL DEFECT
890181	BLUE DOLPHIN PIPELINE CO	07/26/1989	0	0	CORROSION
890197	TRANSCO GAS PIPELINE CORP	07/27/1989	0	0	CONSTRUCTION/MATERIAL DEFECT
890203	AMERICAN NATURAL RESOURCE PIPELINE CO (ANR)	07/28/1989	0	0	CORROSION
890218	CHEVRON USA INC	09/04/1989	0	0	DAMAGE BY OUTSIDE FORCES
890243	AMERICAN NATURAL RESOURCE PIPELINE CO (ANR)	10/05/1989	0	0	CORROSION
890250	AMERICAN NATURAL RESOURCE PIPELINE CO (ANR)	09/24/1989	0	0	CORROSION
890262	NATURAL GAS PIPELINE CO OF AMERICA	10/03/1989	11	3	DAMAGE BY OUTSIDE FORCES
890270	NATURAL GAS PIPELINE CO OF AMERICA	11/01/1989	0	0	CORROSION
890283	COLUMBIA GULF TRANSMISSION CO	12/02/1989	0	0	DAMAGE BY OUTSIDE FORCES